ATM S 111, Global Warming
The Debate

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Day 35: August 9, 2010

Announcements

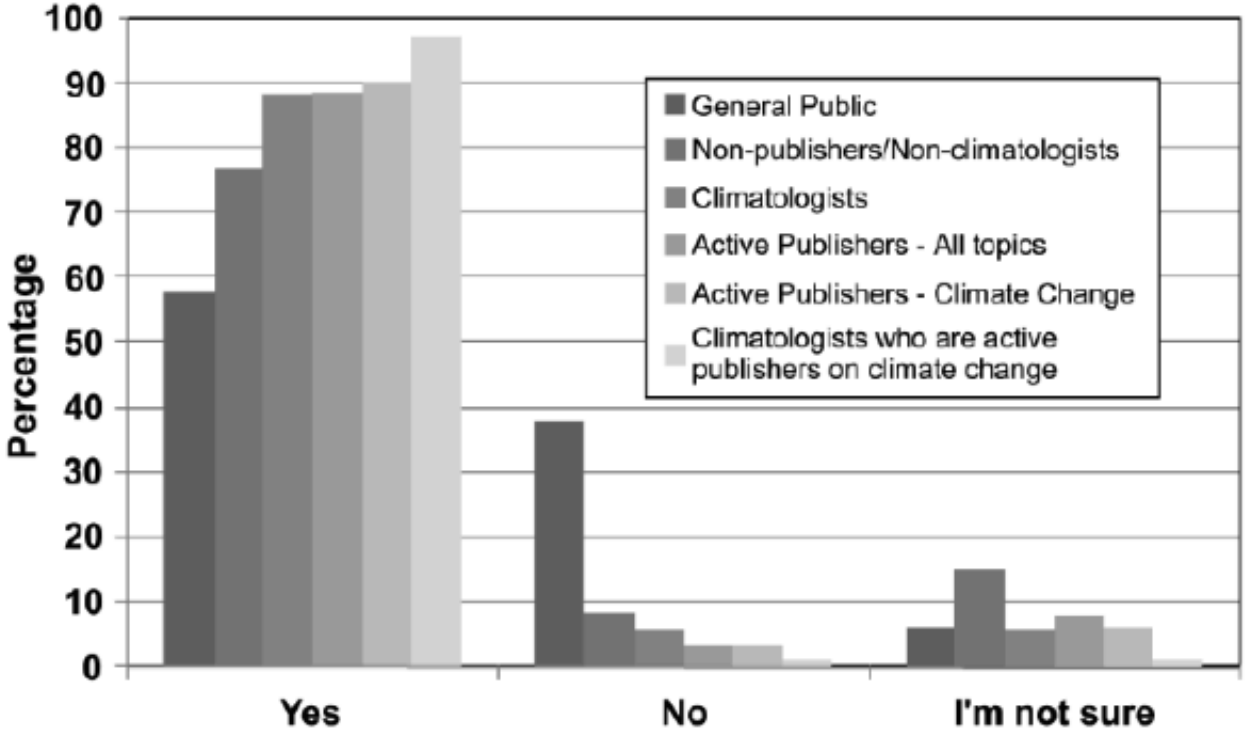
- By this Friday (8/13): let me know what your paper/project topic is.
- If you're writing a paper, a rough draft is due next Monday (8/16).
- If you're doing a presentation for the class, please plan to do it 8/19 (next Thursday)
- If you're writing a paper, the due date is Friday August 20. Email submissions are encouraged.
- Class is canceled on Friday August 20.

Next Topic: **The Debate**

- Why is everyone so upset/confused/misinformed about global warming?
- 2007 poll from Yale University on detection of global warming:
  - **71%** of Americans believe global warming is happening
  - But only **48%** believe there is consensus among the scientific community about whether Earth is warming
  - And **40%** believe there is a lot of **disagreement** among scientists about **whether global warming is occurring**
    - There is essentially **no disagreement** among scientists about whether global warming is occurring (even among hard-core skeptics like Lindzen, Christie, etc)

Opinions on **Attribution** of Climate Change

- When asked “Do you think human activity is a significant factor in changing global mean temperature?”

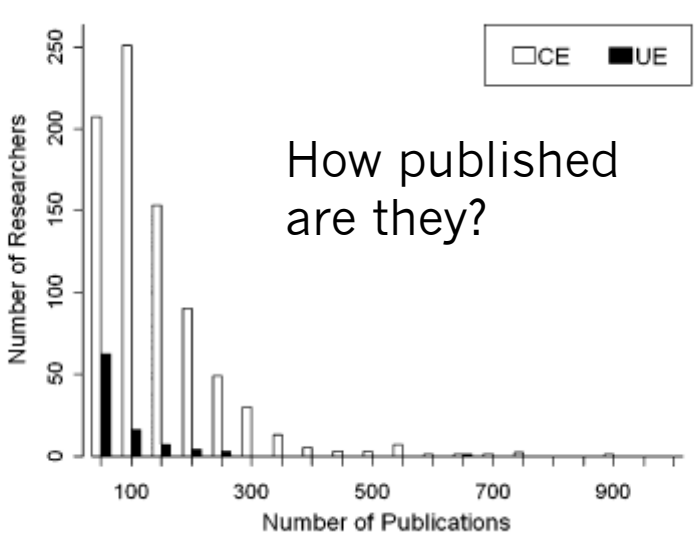


The best informed are most likely to say yes

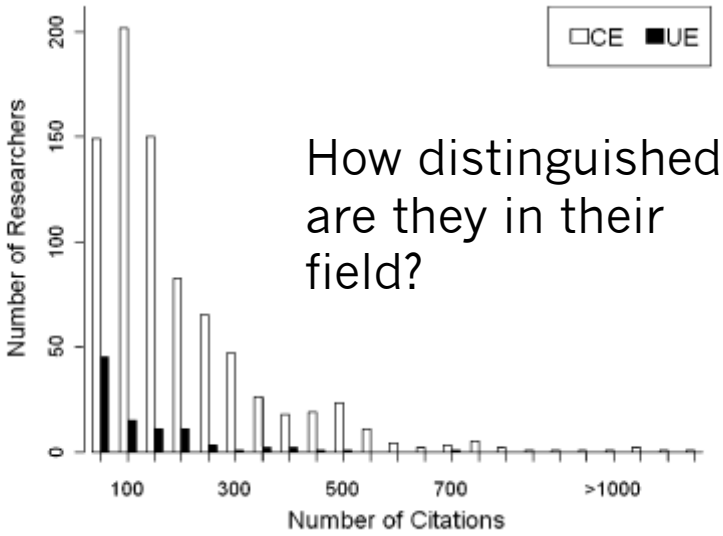
What do climate scientists think?

- Recent study in *Proceedings of the National Academy of Sciences* (Anderegg et al, 2010) finds that 97% of climate change researchers (people who actively publish in climate related peer reviewed journals) accept the tenets of anthropogenic climate change as presented in the recent IPCC report.

- Climate scientists who do not agree that global warming is very likely anthropogenic tend to be less well-published in the field.



How published are they?



How distinguished are they in their field?

CE: Convinced by the Evidence UE: Unconvinced by the Evidence

Why is the public misinformed?

- Lots of disinformation out there...
- “The Great Global Warming Swindle”: Channel 4 documentary from 2007
  - Let’s watch the beginning...
  - http://www.youtube.com/watch?v=6TqqWJugXzs

Just who is being Swindled?

Statement by the British Antarctic Survey:

"Any scientist found to have falsified data in the manner of the Channel 4 programme would be guilty of serious professional misconduct."

The program also claims volcanic activity is a much greater source of CO_2 than human activity. **Completely wrong!** Even the strongest volcanoes of the last century don't make a blip on the CO_2 record.

A British journalist interviews and debates the filmmaker at http://www.youtube.com/watch?v=IIjGynF4qkE&feature=related

Think Tanks

- Engage in research and possibly advocacy on social policy, economics, science and technology, etc. Often non-profit organizations.
- Some exist solely to help entities achieve a desired social, financial or political **outcome**, based on a perceived threat or opportunity
- Type B Think Tanks may use **disinformation** and/or **scare tactics** to achieve their ends
  - Both **liberal** and **conservative** examples of this
  - Financing is often provided by the entities they serve
  - Examples in climate arena:
    - Global Climate Coalition (funded by oil, auto & coal companies)
    - Competitive Enterprise Institute (supported by oil & coal)
    - Cato Institute, George C. Marshall Institute, etc.
    - Ecologic Institute -- European environmental think tank, supported by EU governments, some NGOs, some business

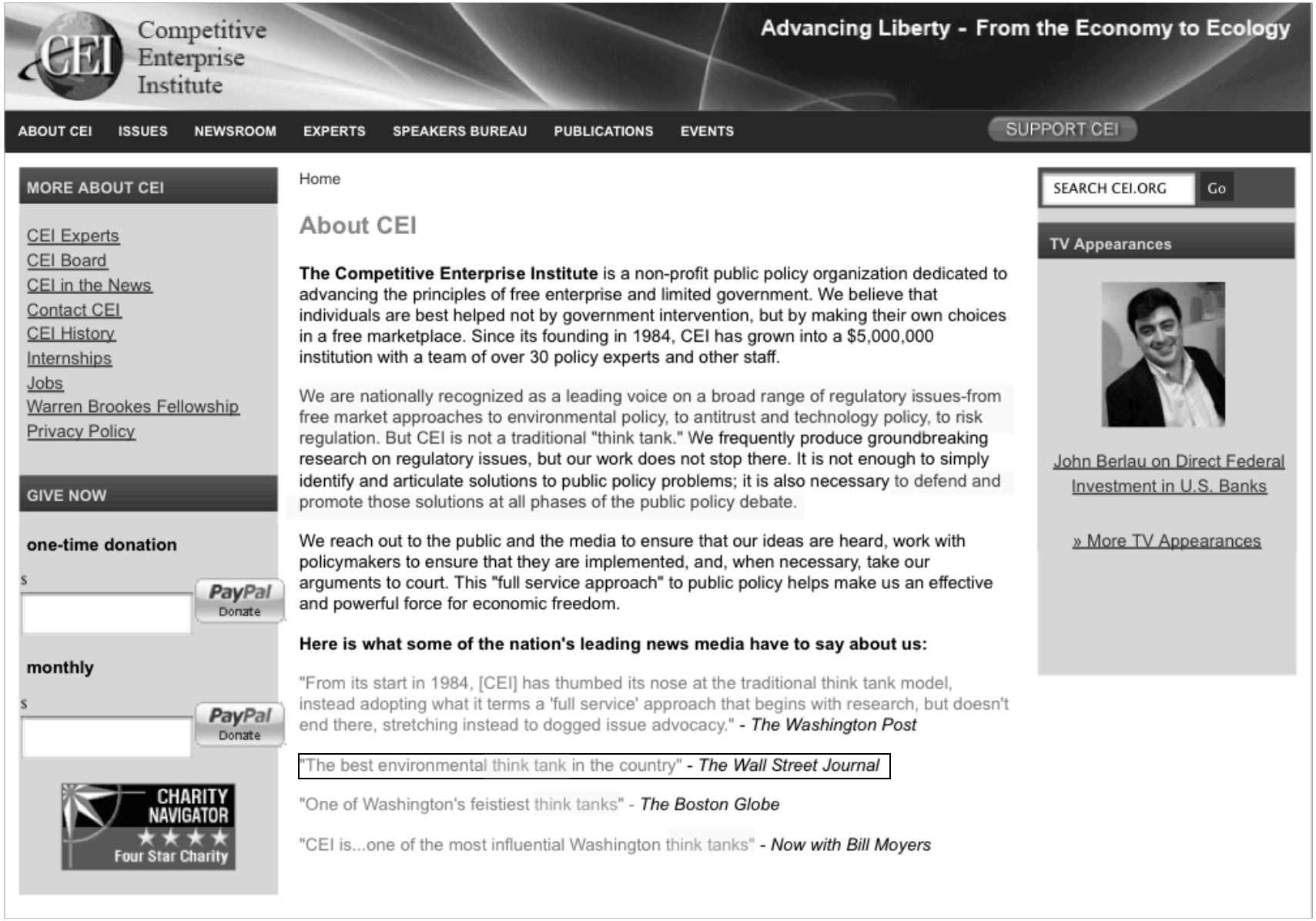
Global Climate Coalition (GCC)

- Started in 1989 by US Association of Manufacturers
- Paid for by GM, Ford, BP, Shell, Exxon & others
- Financed commercials against Kyoto protocol
- Departure of BP (1997), Shell and Ford (1999)
- Deactivated in 2001 after President G. W. Bush rejected Kyoto, stating:
  - GCC "...has served its purpose by contributing to a new national approach to global warming"
- Exxon shifts its support to CEI

Competitive Enterprise Institute (CEI)

- Funded mainly by Exxon Mobile. Also, the American Petroleum Institute, Cigna Corporation, Dow Chemical, EBCO Corp, General Motors, and IBM
  - The leading entity (along with Fox News) now providing propaganda and disinformation on the climate and the state of the climate science
  - CEI Mission statement: “CEI is a non-profit public policy organization dedicated to advancing the principles of free enterprise and limited government. We believe that individuals are best helped not by government intervention, but by making their own choices in a free marketplace.”

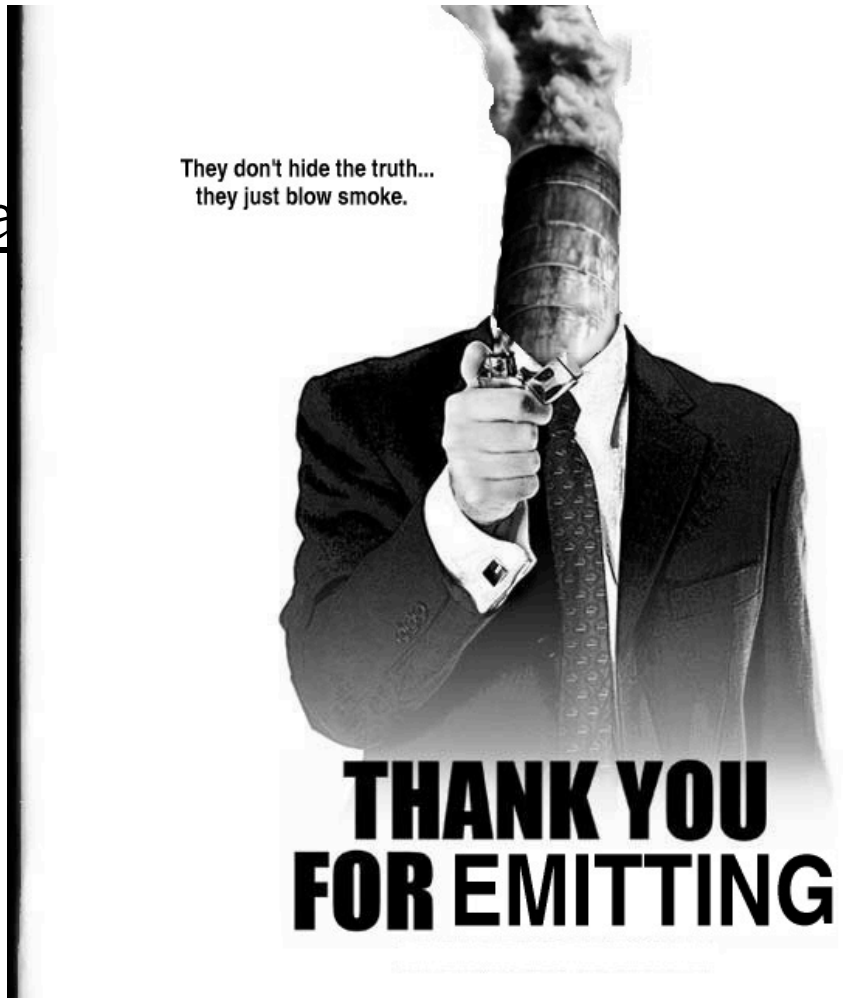
Competitive Enterprise Institute (CEI)



Many scientists view chasing skeptics arguments as nonproductive. But some are devoted to defend…

CEI Commercials

- These ads aired in 14 US cities in May 2006
- Let's watch...
- http://www.youtube.com/wa



Global Warming and Glaciers

- The CEI commercial claims glaciers are growing
  - The paper cited refers only to **interior** Greenland

Recent Ice-Sheet Growth in the Interior of Greenland

Ola M. Johannessen,[1,2*] Kirill Khvorostovsky,[3] Martin W. Miles,[4,5] Leonid P. Bobylev[3]

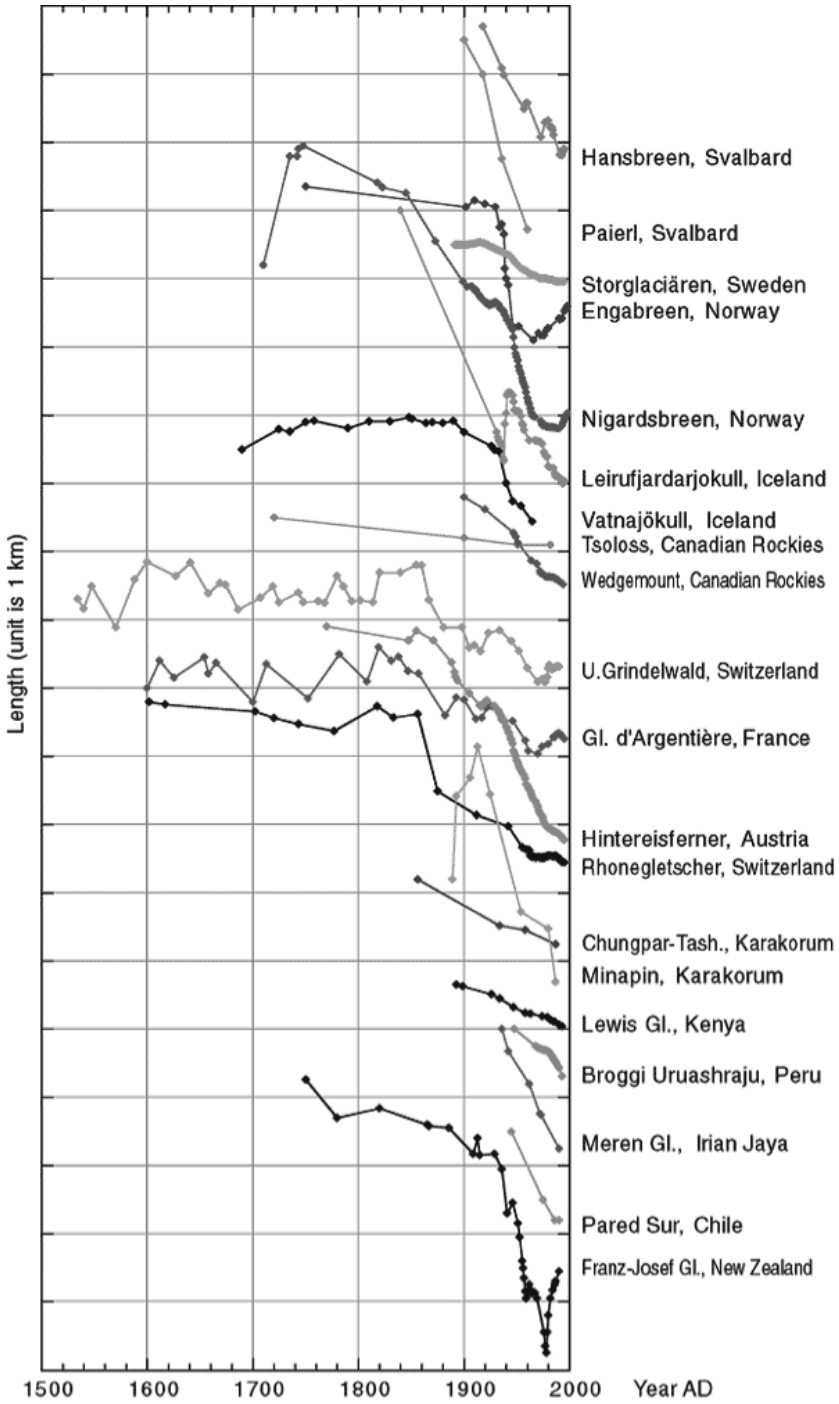
A continuous data set of Greenland Ice Sheet altimeter height from European Remote Sensing satellites (ERS-1 and ERS-2), 1992 to 2003, has been analyzed. An increase of 6.4 ± 0.2 centimeters per year (cm/year) is found in the vast interior areas above 1500 meters, in contrast to previous reports of high-elevation balance. Below 1500 meters, the elevation-change rate is –2.0 ± 0.9 cm/year, in qualitative agreement with reported thinning in the ice-sheet margins. Averaged over the study area, the increase is 5.4 ± 0.2 cm/year, or ~60 cm over 11 years, or ~54 cm when corrected for isostatic uplift. Winter elevation changes are shown to be linked to the North Atlantic Oscillation.

- Interior Greenland and Antarctica are accumulating more snow in the high interior where it is always well below freezing.
  - This is **expected** as the earth warms: higher temperature -> more water vapor -> more precipitation at high latitudes
- These ice sheets, however, are **losing so much mass** on their edges, they are losing mass in total and contributing to sea level rise.

Glaciers

The commercial states that “Global warming alarmists claim that the glaciers are melting because of the carbon dioxide from the fuels we use”

- Sierra Club, Greenpeace, etc
- What does the IPCC conclude, in their summaries of the state of the science? Most of the glaciers in the world are melting, largely due to increased temperature.



Most glaciers in the world are receding due to increased temperature (which has been attributed to burning fossil fuels)

Central Antarctic is increasing in mass (also expected and projected due to global warming)

Other Organizations that present disinformation on climate change

- Greening Earth Society
  - Created by the Western Fuels Association: a not-for profit cooperative that supplies coal and transportation services to consumer-owned electric utility in the Great Plains, Rocky Mountain and Southwest regions.
  - Publishes Pat Michael's World Climate Report
- The Cato Institute
- The George C Marshall Institute (political conservative think tank)
  - Employees have previously worked on other campaigns such as: the carcinogenic nature of **tobacco** smoking, the evidence between CFCs and **ozone depletion**, strategic defense initiative, and now the evidence on climate change in order to resist and delay regulation

The Cato, Marshall and Competitive Enterprise Institutes are supported by many of the same companies and foundations

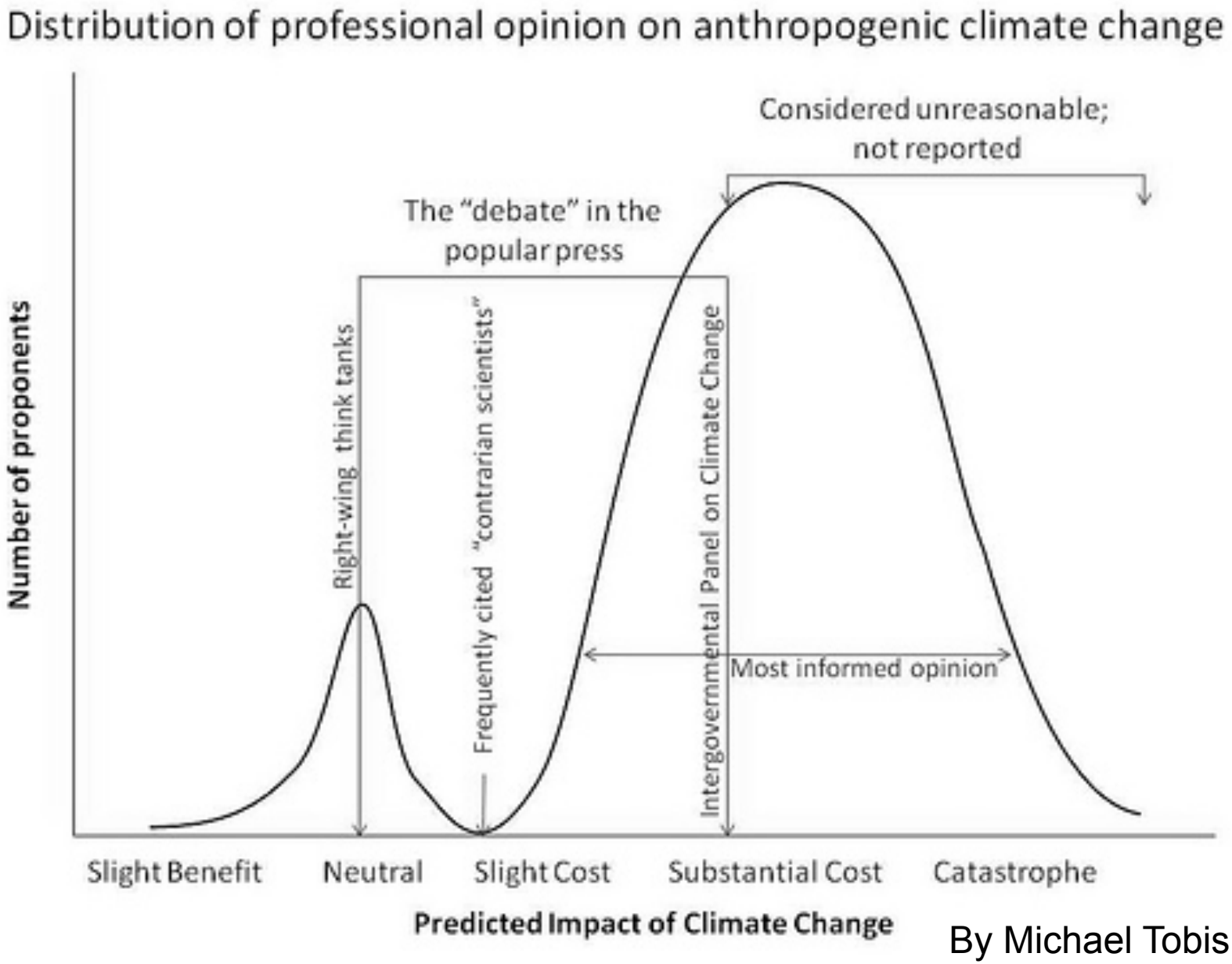
Tactic #1: Talk Up Uncertainty

- "Victory will be achieved when average citizens 'understand' (recognize) uncertainties in climate change": from **leaked internal memo** by the American Petroleum Institute, 1998

- Personally, I think talking about uncertainty is great, should be **encouraged**. However think tanks have spread false doubt about even **the most certain** aspects of the science.
- They also take advantage of public confusion of the meaning of scientific uncertainty.

Role of the Media

- For many years, the media presented global warming as a “he said, she said”-style debate
  - Each scientific study about global warming was accompanied by quotes from a skeptic contradicting in some way
  - Equal time given to someone from the skeptical side, despite their small numbers



By Michael Tobis, UT

I agree with the idea of this conceptual diagram, not necessarily the exact shape of the curve…

Typical Tactics of the Skeptics

- “The atmosphere isn’t warming”, or the data aren’t good enough to say it is warming
  - Not many in this camp anymore, especially atmospheric scientists.
- “The warming is real, but it is natural variability”
- “The theory is flawed: there is no link between human activity and carbon dioxide increase in the atmosphere/warming”
- “The models are uncertain, so we don’t have to act”
- “The projected changes are so small that it doesn’t matter”

Too expensive to solve
(or cheaper to solve in the future)

- "The future warming will happen and the projected changes will have large impacts but it will be cheaper to clean it up in the future than to do something now"
  - A popular argument among skeptics (esp. those who fall into the category "have a lot to lose if we do something now")

- We have a lot of problems (malnutrition, lack of clean water, malaria, HIV/AIDS). These problems are more important/ immediate that Global Warming

- It is too expensive to prevent Global Warming: A tax on emitting carbon would increase the cost of energy derived from fossil fuel (the major source of energy for the developed and developing world) and cripple the global economy

The Big Picture on the Science

- Errors exist and uncertainty exists, but the independent evidence from models observations is consistent with theory:
  - humans have increased major greenhouse gases via burning of fossil fuel and deforestation
  - Atmospheric CO_2 is the largest in at least 3M years

- The warming and other climate trends of the past 100 years is too large to be natural variability, and it is consistent with what is expected due to the observed increases in GH gases

- The changes in CO_2 and climate over the next 100 years are large compared to what happened in the past 150 years, or the past 10,000 years.
  - For example, it is likely the global annual average temperature will increase by between 2.4 and 6.4C by 2100, the subtropics drier.

Good sources of reasonable balanced information on the science

- IPCC: static updates www.ipcc.ch
- US Climate Change Science Program www.climatescience.gov

- Real Climate: real-time commentary on important or highly visible papers/events/statements, etc. Balanced and usually readable; run by active climate scientists www.realclimate.org

- New York Times (not necessarily the op-ed page!)
- Christian Science Monitor (infrequent articles, but usually good)

Sources of information on the science: usually but not always reliable

- The Guardian (UK)
- The Independent (UK)
- Science Magazine
- The journal “Nature”
- Scientific American

Sources of information on the science: almost always garbage

- The Wall Street Journal (editorial page)
- The Competitive Enterprise Institute (CEI)
- Cato & Marshall Institutes (Libertarian “think tank”)

Extremists: who are they?
The non-scientists

- Stakeholders who feel they have a lot to lose if mitigation strategies are invoked (oil companies, SUV manufacturers, coal industry, etc.)

- Non-scientists with political or ethical bents that are at odds with mitigation. Lots of examples:
  - Libertarian societies and orgs and their followers
  - A pop-culture example is Glenn Beck. Another is Michael Crichton, novelist and author of "State of Fear," novel written w/ footnotes and graphs (to give a look like it was a story backed by science). Information grossly distorted (for a full science critique, see www.realclimate.org and references therein)

- Environmental organizations don't always accurately present the science either (though *An Inconvenient Truth* is very good [scientifically])

Extremists: who are they?
The scientists

- Climate scientists with political or ethical values that supercede the constraints levied by the ethics of science (testing hypotheses, ignoring the overwhelming evidence against a belief they hold)

Extremists are almost always motivated by issues *not* related to (uncertainty in) the science

Claim: “Climate scientists promote global warming to make money”

- Facts (US):
  - There are **many** other interesting and reasonably well funded sciences. Climate change scientists could easily retool.
  - Republicans have been more generous in funding climate science than Democrats
    - Climate Change Research did much better under Bush I-II than under Clinton: “Think more, do nothing” because “Not enough is known” and “There is too much uncertainty”
  - Salary for university scientist is controlled by the University
    - Normal appointment is nine months; summer pay from grants
  - Most of the climate scientists in the ‘skeptics’ category are funded by oil and gas companies, or by entities that oil and gas supports.

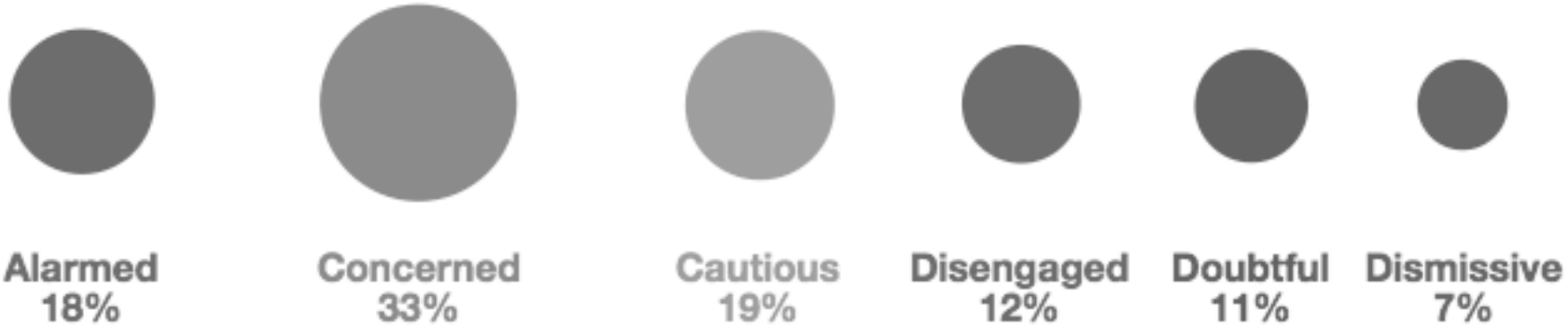
    For example, the American Petroleum Institute, the Competitive Enterprise Institute

Next: The Sociology of Global Warming

- Global Warming's Six Americas: An Audience Segmentation Analysis

Figure 1: Proportion of the U.S. adult population in the Six Americas

Proportion represented by area



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Results from the 6 Americas Survey

Figure 2: Certainty of belief in the reality of global warming

Do you think that global warming is happening?
How sure are you that global warming is happening? or
How sure are you that global warming is not happening?

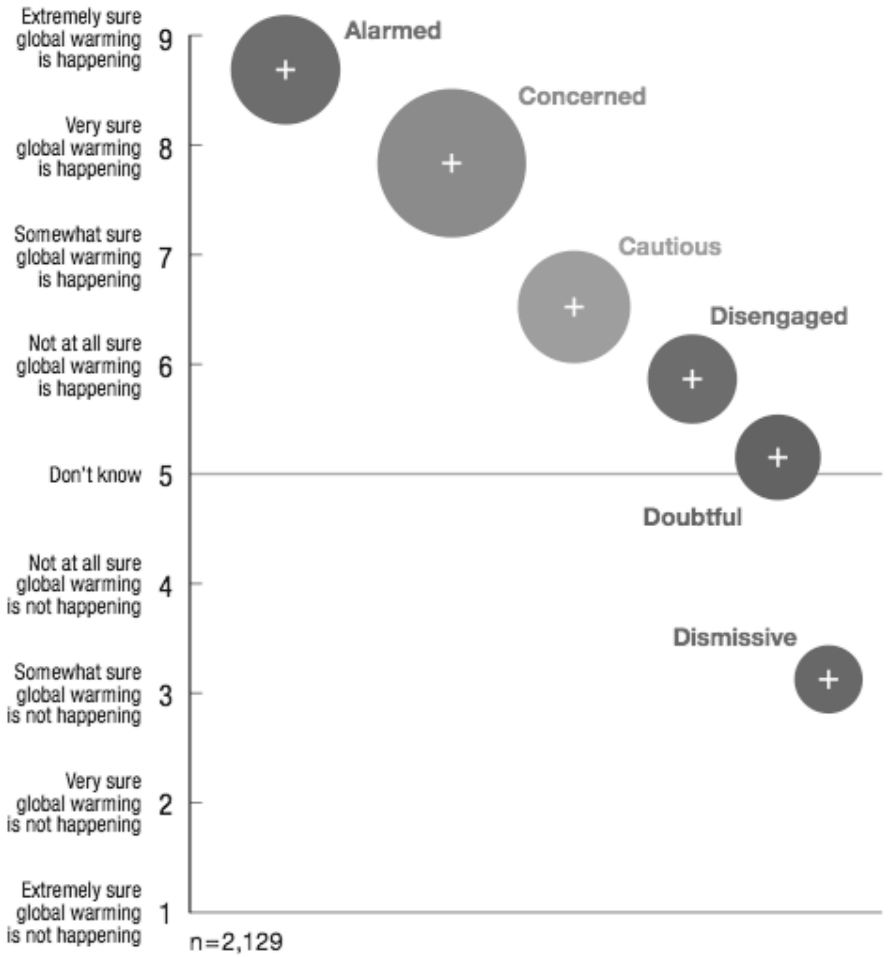
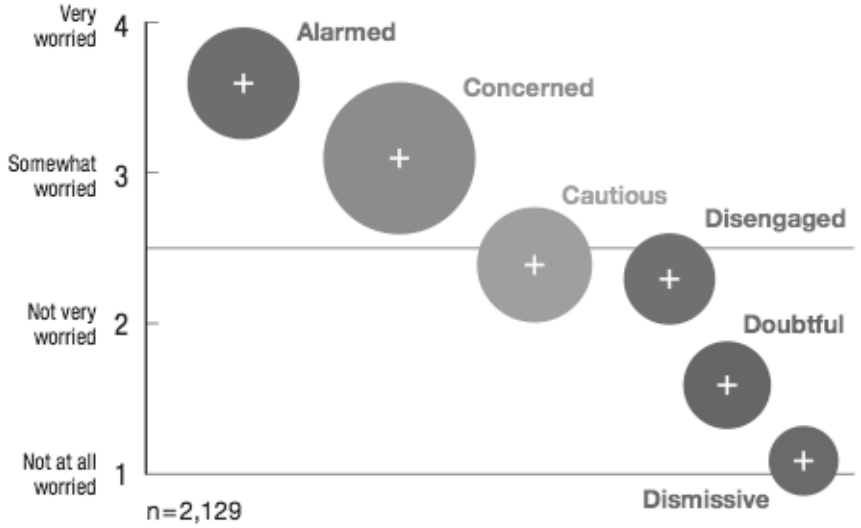


Figure 4: Worry

How worried are you about global warming?



Results from the 6 Americas Survey

Figure 5: Attitudinal certainty

"I could easily change my mind about global warming."

Figure 6: Amount of thought about global warming

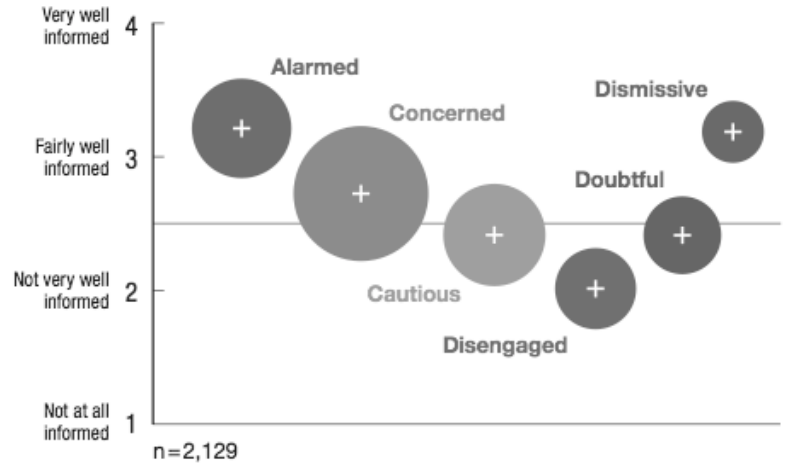
How much had you thought about global warming before today?

Figure 7: Self-assessed knowledge

Personally, do you think that you are well informed or not about …

- *… the different causes of global warming*
- *… the different consequences of global warming*
- *… ways in which we can reduce global warming.*

Results shown below are the average of the three responses.



Results from the 6 Americas Survey

Figure 9: Beliefs about the scientific consensus

Which comes closer to your own view?
- *Most scientists think global warming is happening*
- *Most scientists think global warming is not happening*
- *There is a lot of disagreement among scientists about whether or not global warming is happening*
- *Don't know enough to say*

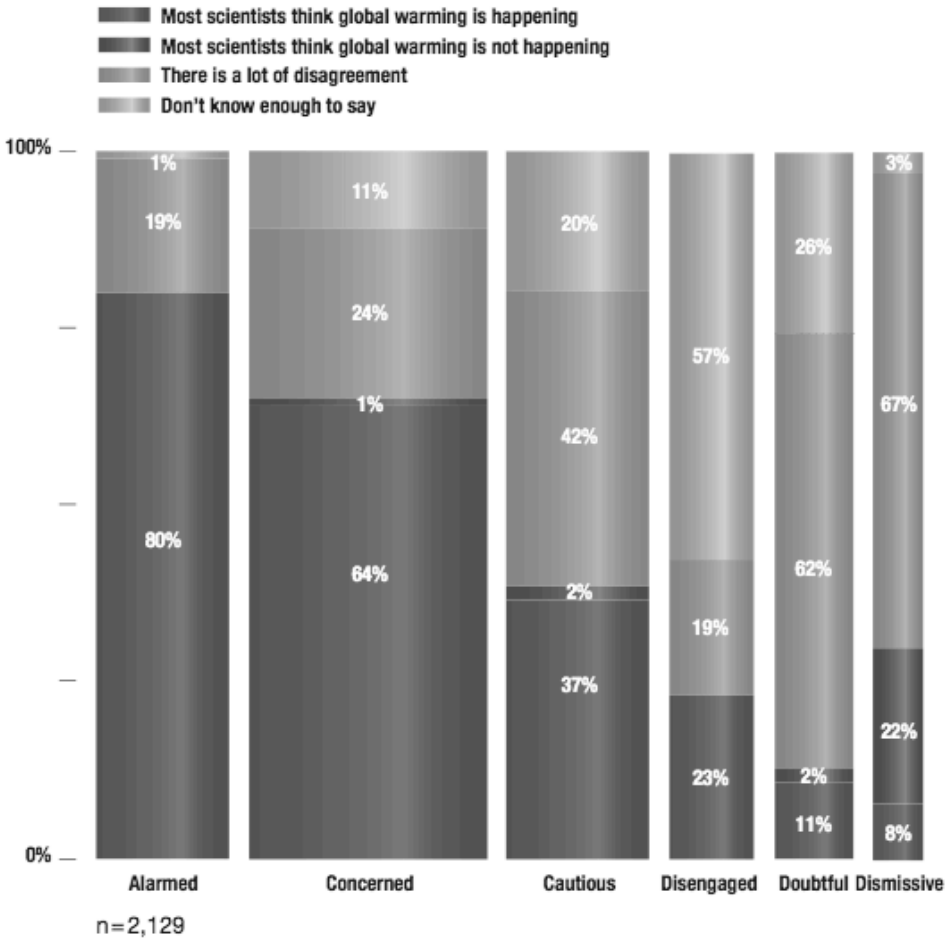


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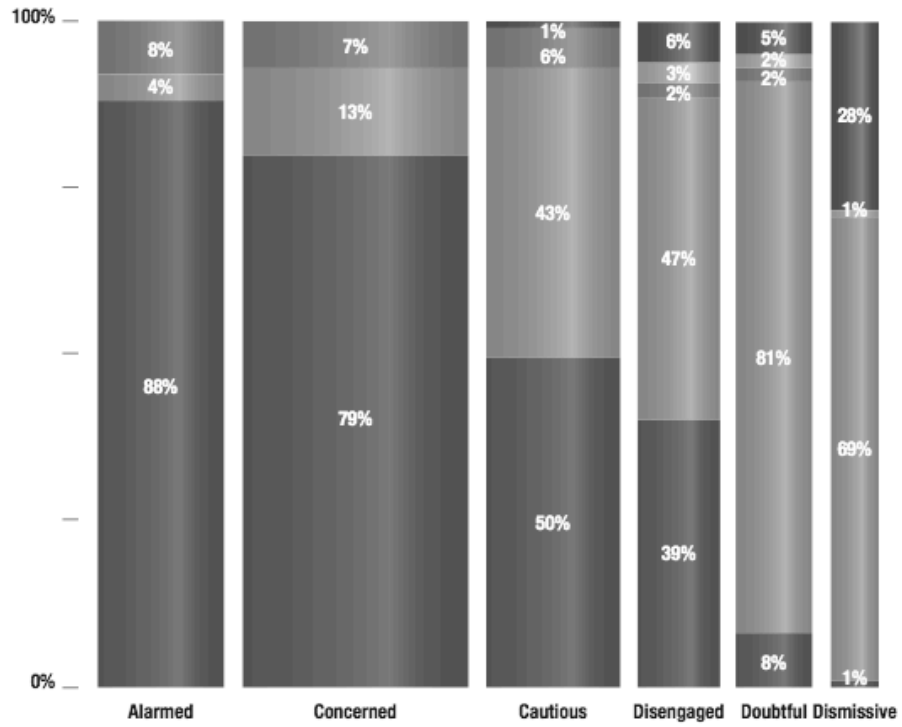
Figure 8: Beliefs regarding the causes of global warming

If global warming is happening, do you think it is:
- *Caused mostly by human activities*
- *Caused mostly by natural changes in the environment*
- *Other (Please specify)*
- *None of the above because global warming isn't happening*



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Note: In this figure (and all subsequent figures with columns), the column width accurately represents the proportion of the American public in each segment.

Results from the 6 Americas Survey

Figure 10: Personal threat of global warming

How much do you think global warming will harm you personally?

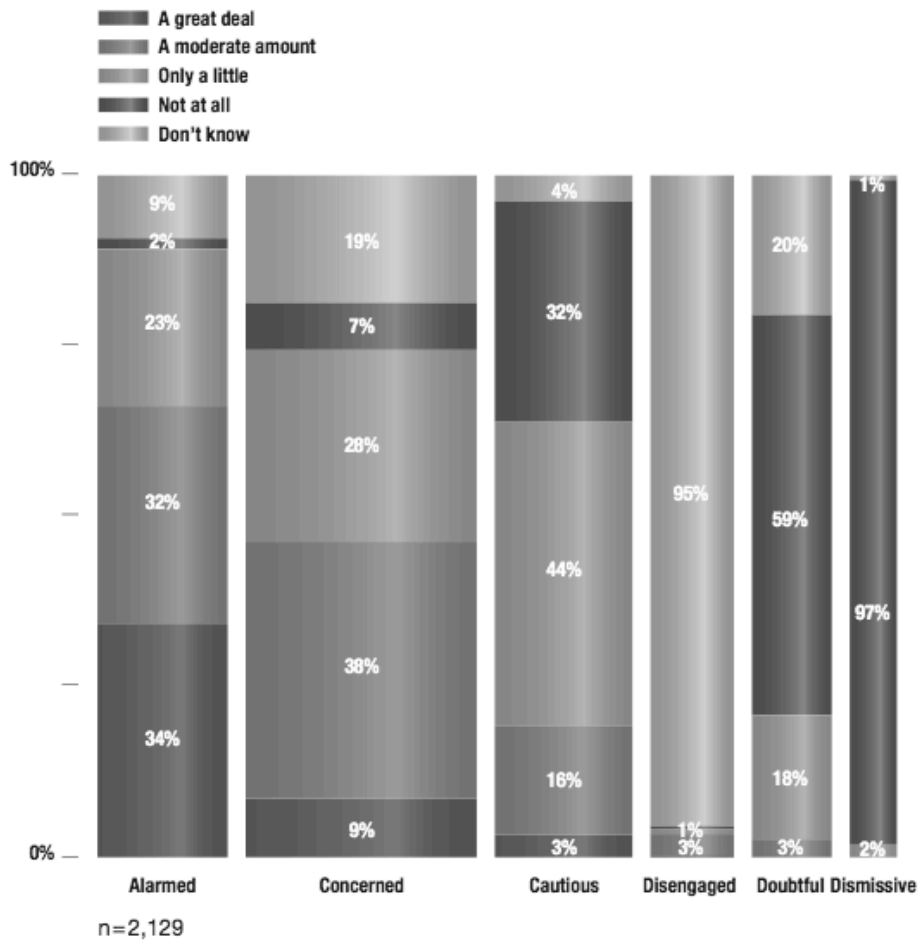

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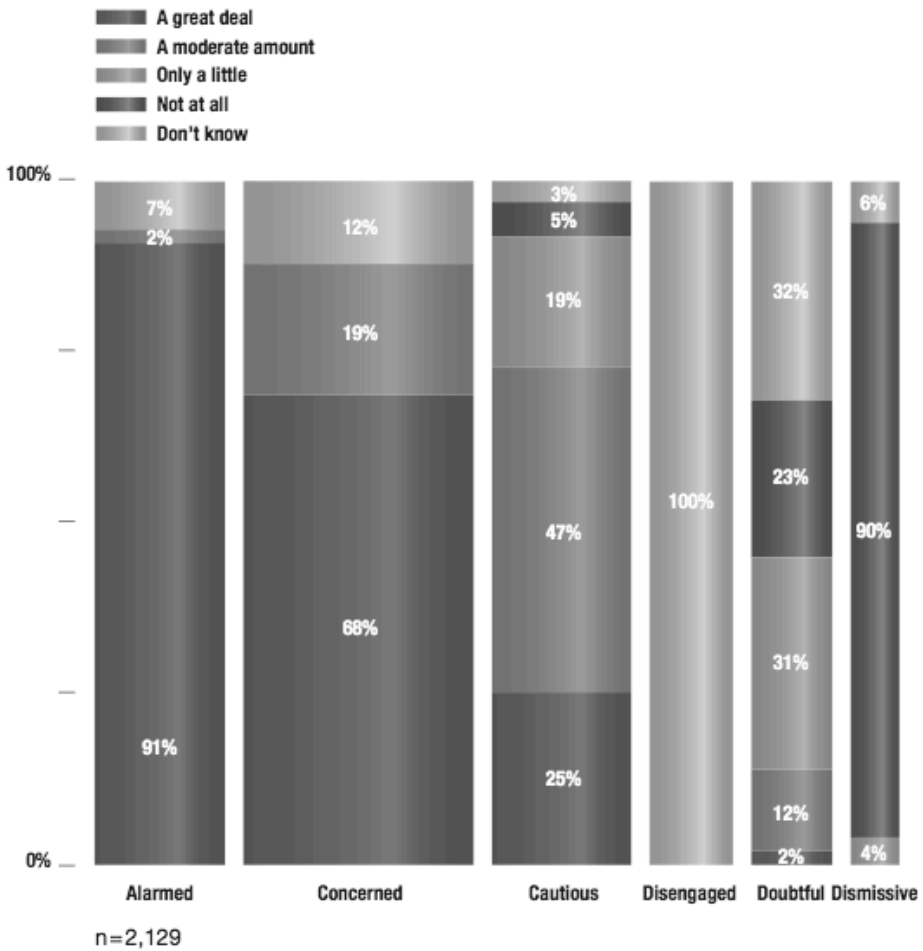
Figure 11: Threat to future generations

How much do you think global warming will harm future generations of people?



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Links to the Full Study

- http://envirocenter.research.yale.edu/BlankOfTheMonth/34/67
- Other studies by this organization:
  - http://environment.yale.edu/climate/
- The ABC News “Nature’s Edge” Podcast:
  - *http://itunes.apple.com/us/podcast/natures-edge/id306530021*
  - *Or:*
    - http://abcnews.go.com/abcnewsnow/NaturesEdge/